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Quantifying the effects of harvesting on carbon fluxes and stocks in northern temperate forests

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Table S1 Parameter values used in the simulations of PnET-CN for both deciduous broadleaf forests (DBF) and evergreen needleleaf forests (ENF) in the Upper Midwest region of Wisconsin and Michigan, United States.

Parameter	Description	DBF	ENF
Canopy and photosynthesis			
AmaxA	Intercept (A) and slope (B) for relationship between Foliar N and max. photosynthesis (nmol CO_2 g^{-1} leaf s^{-1})	-46	5.3
AmaxB		71.9	21.5
AmaxFrac	Daily Amax as a fraction of early morning instantaneous rate	0.76	0.76
CFracBiomass	Carbon fraction of biomass	0.49	0.49
DVPD1	Coefficients for power function converting VPD to fractional lose in photosynthesis	0.05	0.05
DVPD2		2	2
FolRelGroMax	Maximum relative growth rate for foliage (% $year^{-1}$)	0.95	0.3
FolReten	Foliage retention time (year)	1	2.3
HalfSat	Half saturation light level (J m^{-2} s^{-1})	150[a]	150[a]
k	Canopy light attenuation constant coefficient	0.58	0.48[a]
PsnTMin	Minimum temperature for photosynthesis (˚C)	4	0
PsnTopt	Optimum temperature for photosynthesis (˚C)	24	22
SLWDel	Change in specific leaf weight (SLW) with increasing foliar mass above (g dm m^{-2} g^{-1})	0.2	0
SLWMax	Top canopy SLW (g dm m^{-2})	81[a]	258[a]
Respiration			
Ksom	Decomposition rate for soil organic carbon pool ($year^{-1}$)	0.075	0.075
BaseFolRespFrac	Dark respiration as a fraction of max. photosynthesis	0.05[b]	0.05[b]
GRespFrac	Ratio of growth respiration to component production	0.20	0.20
RootMRespFrac	Ratio of fine root maintenance respiration to root biomass production	1	1
RespQ10	Q_{10} value for leaf maintenance respiration	2.5[c]	2.5[d]
WoodMRespA	Fraction of wood maintenance respiration over total photosynthesis.	0.07	0.07

Allocation			
PlantCReserveFrac	Fraction of non-structural plant C held in reserve after allocation to wood carbon	0.75	0.75
RootAllocA	Intercept (A) and Slope (B) of relationship between foliar and root allocation	0	0
RootAllocB		2	2
MinWoodFolRatio	Minimum ratio of carbon allocation to wood and foliage	0.8	0.5
Turnover			
WoodLitCLose	Fractional loss of woody mass as CO_2 in wood decomposition	0.8	0.8
WoodLitLoseRate	Fractional loss of woody mass either to soil organic carbon pool or to atmosphere	0.1	0.1
WoodTurnover	Fractional mortality of live wood per year	0.025	0.02
RootTurnoverA		0.789	0.789
RootTurnoverB	Coefficients for fine root turnover	0.191	0.191
RootTurnoverC		0.021	0.021
Phenology			
GDDFolEnd	Growing degree days of at which foliage production ends (˚C)	764	1031
GDDFolStart	Growing degree days of at which foliage production onset (˚C)	332	332
GDDWoodEnd	Growing degree days of at which wood production ends (˚C)	764	1031
GDDWoodStart	Growing degree days of at which wood production onset (˚C)	332	332
SenescStart	Day of year after which leaf drop can occur (days)	270	270
Nitrogen (N)			
FLPctN	Minimum N concentration in foliar litter (%)	0.9	0.45
FolNConRange	Maximum fractional increase in N concentrations	0.5	0.7
FolNRetrans	Foliage N retention time (year)	0.5	0.5
MaxNStore	Maximum N content in non-structural N pool (g N m^{-2})	76	76
NImmobB	Coefficients for fraction of mineralized N remobilized as a function of soil organic matter	151	151
NImmobA		-35	-35
RLPctN	Minimum N concentration in root litter (%)	1.2	1.2

WLPctN	Minimum N concentration in wood litter (%)	0.2	0.2
Water balance			
f	Soil water release parameter	0.04	0.04
FastFlowFrac	Fraction of water inputs lost directly to drainage	0.1	0.1
PrecIntFrac	Fraction of precipitation intercepted and evaporated	0.11	0.11
WUEConst	Water use efficiency at 1 kPa of vapor pressure deficit (g CO2 kg^{-1} H_2O)	10.9	10.9

[a] Estimated based on measurements of Ryu et al. (2008).

[b] Estimated based on estimated percentage (4.5-9.7%) of leaf respiration to total ecosystem respiration by Bolstad et al. (2004).

[c] Estimated based on Q_{10} range (2.27-2.98) from measured leaf respiration rates of Bolstad et al. (2004).

[d] Estimated based on the synthesis study of Atkin & Tjoelker (2003).

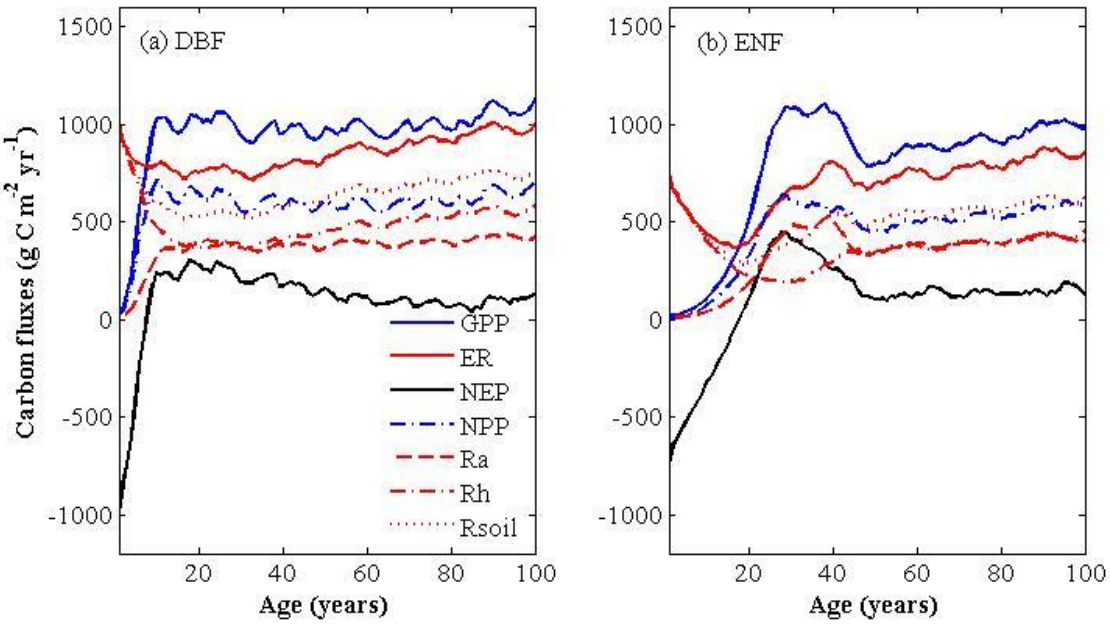

Figure S1. Simulated trajectories of ecosystem carbon fluxes (GPP, gross primary production; ER, ecosystem respiration; NEP, net ecosystem production; NPP, net primary production; Ra, autotrophic respiration; Rh, heterotrophic respiration; Rsoil, soil respiration) with stand age for (a) deciduous broadleaf forests (DBF) and (b) evergreen needleleaf forests (ENF). The simulated curves were smoothed using a moving average filter with a span of 5.

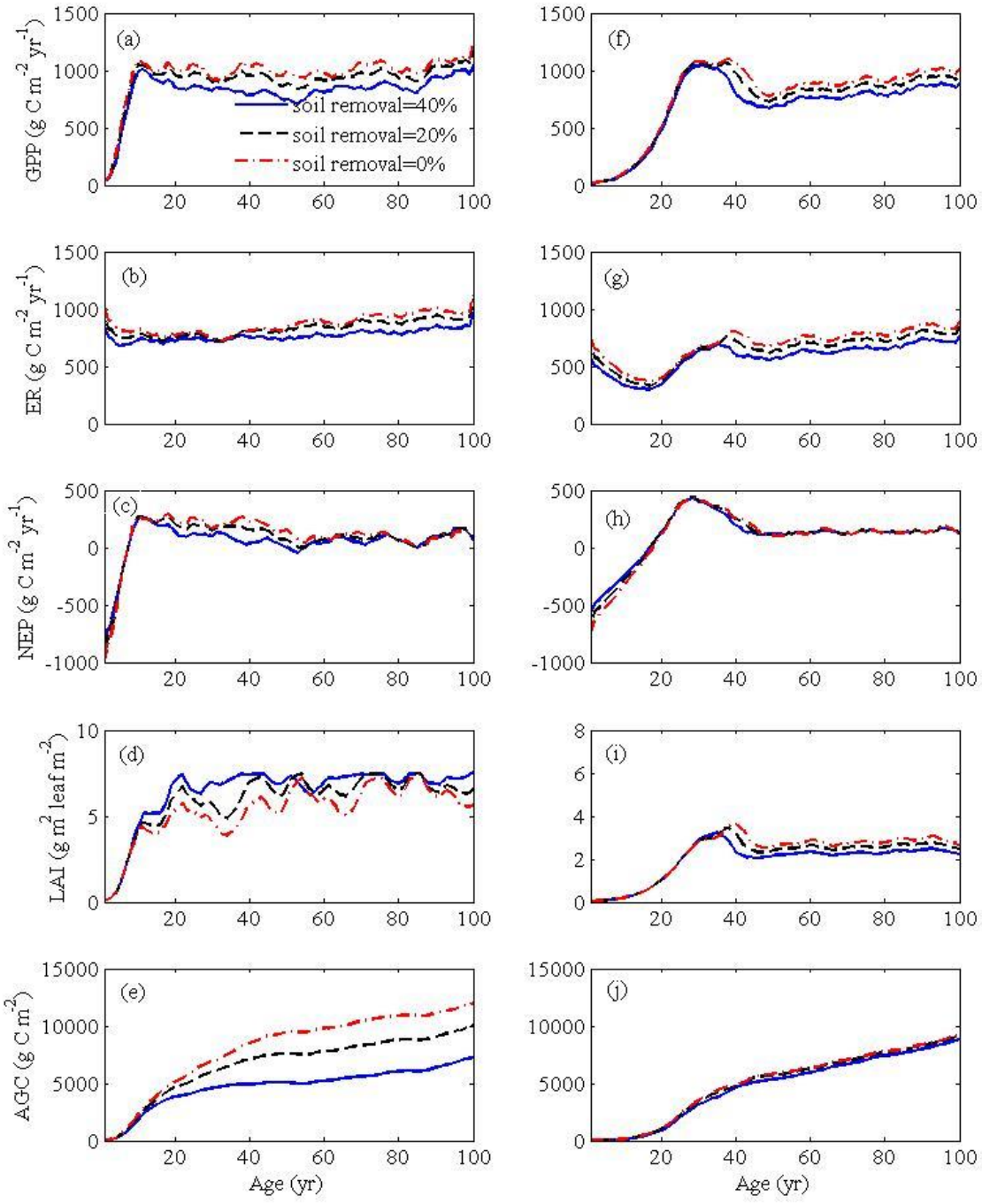

Figure S2. Sensitivity of carbon fluxes (GPP, gross primary production; ER, ecosystem respiration; NEP, net ecosystem production) and stand characteristics (LAI: leaf area index; AGC: aboveground carbon stock) to soil removal fraction parameter for (a-e) deciduous

broadleaf forests (DBF) at Willow creek and (f-j) evergreen needleleaf forests (ENF) at Mature red pine site over a 100-yr harvest cycle. The simulated curves were smoothed using a moving average filter with a span of 5.

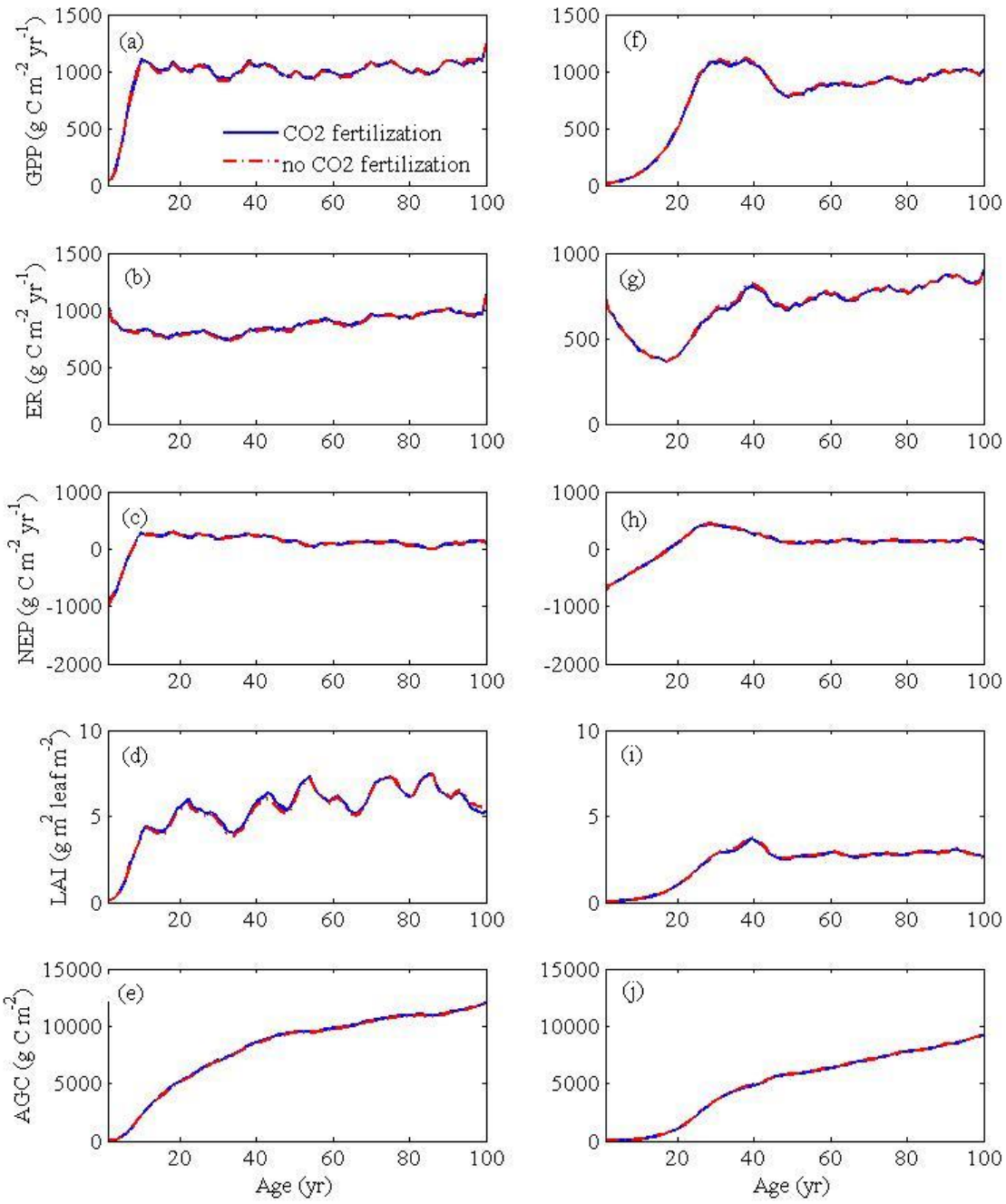

Figure S3. Sensitivity of carbon fluxes (GPP, gross primary production; ER, ecosystem respiration; NEP, net ecosystem production) and stand characteristics (LAI: leaf area index; AGC: aboveground carbon stock) to CO_2 fertilization for (a-e) deciduous broadleaf forests (DBF) at Willow creek and (f-j) evergreen coniferous forests (ENF) at Mature red pine site over

a 100-yr harvest cycle. The simulated curves were smoothed using a moving average filter with a span of 5.

References:

Atkin, O.K. and Tjoelker, M.G., 2003. Thermal acclimation and the dynamic response of plant respiration to temperature. Trends Plant Sci., 8(7): 343-351.

Bolstad, P.V., Davis, K.J., Martin, J., Cook, B.D. and Wang, W., 2004. Component and whole-system respiration fluxes in northern deciduous forests. Tree Physiol., 24(5): 493-504.

Ryu, S.-R., Chen, J., Noormets, A., Bresee, M.K. and Ollinger, S.V., 2008. Comparisons between PnET-Day and eddy covariance based gross ecosystem production in two Northern Wisconsin forests. Agric. For. Meteorol., 148(2): 247-256.